

Claims

We claim:

5 1. A ventilating and heating apparatus for installation in a building structure, the apparatus comprising:

 a main housing;

 a fan housing positioned in the main housing, the fan housing having a discharge duct terminating in a discharge outlet;

10 a fan located within the fan housing and rotatable about an axis; and

 a heater in the discharge duct and operatively coupled to and shielded from a discharge outlet by at least one interior wall of the discharge duct.

2. The ventilating and heating apparatus of claim 1, wherein:

15 the discharge outlet lies in a plane;

 an imaginary cylinder extends in a direction normal to the discharge outlet and has a cross-sectional shape and size that is the same as that of the discharge outlet; and
 the heater lies outside of the imaginary cylinder.

20 3. The ventilating and heating apparatus of claim 1, wherein an area directly

below the main housing and the heater is shielded from the heater by at least one interior wall of the discharge duct.

4. The ventilating and heating apparatus of claim 1, wherein:

25 the heater is located in a position along the discharge duct;

 the discharge duct defines an imaginary cylinder extending from the position and along the discharge duct;

 the imaginary cylinder has a cross-sectional shape and size that is the same as that of the discharge duct at the position; and

30 substantially no part of the imaginary cylinder extends out of the discharge outlet.

5. The ventilating and heating apparatus of claim 1, wherein the heater is located in a substantially straight portion of the discharge duct.

6. The ventilating and heating apparatus of claim 1, wherein the discharge outlet is located at an angle with respect to discharge duct.

5 7. The ventilating and heating apparatus of claim 1, wherein the heater is removably secured in the discharge duct.

8. The ventilating and heating apparatus of claim 1, wherein the discharge duct includes a substantially straight portion extending from a chamber in which the fan is located
10 and an elbow extending from the substantially straight portion.

9. The ventilating and heating apparatus of claim 8, wherein:
the substantially straight portion of the discharge duct defines a first cross-sectional area taken along a plane normal to the straight portion;
15 the discharge outlet defines a second cross-sectional area taken along a plane normal to flow of air through the discharge outlet; and
the second cross-sectional area is less than the first cross-sectional area.

10. The ventilating and heating apparatus of claim 1, further comprising at least
20 one illumination device coupled to the main housing.

11. The ventilating and heating apparatus of claim 1, further comprising a cover coupled to and substantially closing an open side of the main housing, the cover having a discharge aperture defined therein and in fluid communication with the discharge outlet of
25 the fan housing, the discharge aperture of the cover having a larger cross-sectional area than the discharge outlet of the fan housing such that edges of the cover defining a periphery of the discharge aperture are recessed with respect to the discharge outlet of the fan housing.

12. The ventilating and heating apparatus of claim 11, further comprising a screen
30 coupled to the cover and positioned in a path of air exiting the discharge outlet.

13. The ventilating and heating apparatus of claim 1, wherein:
the main housing includes at least one aperture therein;
the fan housing includes at least one protrusion; and
the fan housing is removably coupled to the main housing by engaging the at least one

5 protrusion within the at least one aperture.

14. The ventilating and heating apparatus of claim 1, wherein the fan housing
includes

10 a first side wall having a peripheral flange extending therefrom in a direction
substantially normal to the first side wall;
a second side wall substantially identical to the first side wall, spaced from the
first side wall, and in facing relationship from the first side wall; and
at least one additional wall coupled to the peripheral flanges of the first and
second side walls and extending along the outer periphery of the first and second side walls.

15

15. The ventilating and heating apparatus of claim 1, further comprising
a first dividing wall positioned in the main housing to at least partially
separate the main housing into a first compartment and a second compartment;

20 a ventilation fan assembly positioned in the first compartment; and
an electrical compartment positioned in the first compartment at a location
adjacent the first dividing wall, the electrical compartment enclosing electrical wiring
associated with the ventilation fan assembly.

16. The ventilating and heating apparatus of claim 15, further comprising a second
25 dividing wall positioned in the second compartment and extending between the first dividing
wall and a side wall of the main housing to subdivide the second compartment into a first
sub-compartment and a second sub-compartment, wherein the fan housing is positioned in
the first sub-compartment, and wherein the electrical wiring associated with the ventilation
fan assembly is passed through an aperture in the first dividing wall and into the second sub-
30 compartment.

17. The ventilating and heating apparatus of claim 16, wherein the electrical wiring associated with the ventilation fan assembly is passed from the second sub-compartment to an exterior of the main housing via at least one outlet aperture in a side wall of the main housing.

5

18. The ventilating and heating apparatus of claim 16, wherein electrical wiring associated with the fan and heater in the first sub-compartment is passed into the second sub-compartment via an aperture in the second dividing wall.

10

19. A ventilating and heating apparatus for installation in a building structure, the apparatus comprising:

a main housing;

a fan housing positioned in the main housing, the fan housing having a discharge duct terminating in a discharge outlet;

15

a heater positioned in the discharge duct and operable to heat airflow passing through the discharge duct, the discharge duct having a first cross-sectional area taken along a plane normal to the discharge duct at the heater, the discharge outlet having a second cross-sectional area taken along a plane normal to airflow passing through the discharge outlet, wherein the second cross-sectional area is less than the first cross-sectional area.

20

20. The ventilating and heating apparatus of claim 19, wherein a ratio of the first cross-sectional area to the second cross-sectional area is no greater than 4:1 and is no less than 1.125:1.

25

21. The ventilating and heating apparatus of claim 19, wherein a ratio of the first cross-sectional area to the second cross-sectional area is no greater than 1.75:1 and is no less than 1.25:1.

30

22. The ventilating and heating apparatus of claim 19, wherein a ratio of the first cross-sectional area to the second cross-sectional area is no greater than 1.625:1 and is no less than 1.375:1.

23. The ventilating and heating apparatus of claim 21, wherein a ratio of the first cross-sectional area to the second cross-sectional area is about 1.5:1.

24. The ventilating and heating apparatus of claim 19, wherein:

the discharge duct includes a substantially straight portion extending from a central chamber of the fan housing and an elbow extending from the substantially straight portion; and

the heater is positioned in the substantially straight portion of the discharge duct.

25. The ventilating and heating apparatus of claim 19, wherein:

the discharge outlet lies in a plane and defines an imaginary cylinder extending in a direction normal to airflow through the discharge outlet; and

the heater lies outside of the imaginary cylinder.

26. The ventilating and heating apparatus of claim 19, wherein an area directly below the heater is shielded from the heater by at least one interior wall of the discharge duct.

15

27. The ventilating and heating apparatus of claim 19, wherein the heater is located in a portion of the discharge duct defining an imaginary cylinder, and wherein substantially no part of the imaginary cylinder extends out of the discharge outlet.

20

28. The ventilating and heating apparatus of claim 19, wherein the heater is removably secured in the discharge duct.

29. The ventilating and heating apparatus of claim 19, further comprising at least one illumination device coupled to the main housing.

25

30. The ventilating and heating apparatus of claim 19, further comprising a cover coupled to and substantially closing an open side of the main housing, the cover having a discharge aperture defined therein and in fluid communication with the discharge outlet of the fan housing, the discharge aperture of the cover having a larger cross-sectional area than the discharge outlet of the fan housing such that edges of the cover defining a periphery of the discharge aperture are recessed with respect to the discharge outlet of the fan housing.

31. The ventilating and heating apparatus of claim 30, further comprising a screen coupled to the cover and positioned in a path of airflow through the discharge outlet.

32. The ventilating and heating apparatus of claim 19, wherein:
the main housing includes at least one aperture therein;
the fan housing includes at least one protrusion; and
5 the fan housing is removably coupled to the main housing by engaging the at least one protrusion within the at least one aperture.

33. The ventilating and heating apparatus of claim 19, wherein the fan housing includes

10 a first side wall having a peripheral flange extending therefrom in a direction substantially normal to the first side wall;

a second side wall substantially identical to the first side wall, spaced from the first side wall, and in facing relationship with the first side wall; and

15 at least one additional wall coupled to the peripheral flanges of the first and second side walls and extending along the outer periphery of the first and second side walls.

34. The ventilating and heating apparatus of claim 19, further comprising:

a first dividing wall positioned in the main housing to at least partially separate the main housing into a first compartment and a second compartment;

20 a ventilation fan assembly positioned in the first compartment; and

an electrical compartment positioned in the first compartment at a location adjacent the first dividing wall, the electrical compartment enclosing electrical wiring associated with the ventilation fan assembly.

25 35. The ventilating and heating apparatus of claim 34, further comprising a second dividing wall positioned in the second compartment and extending between the first dividing wall and a side wall of the main housing to subdivide the second compartment into a first sub-compartment and a second sub-compartment, wherein the fan housing is positioned in the first sub-compartment, and wherein the electrical wiring associated with the ventilation 30 fan assembly is passed through an aperture in the first dividing wall into the second sub-compartment.

36. The ventilating and heating apparatus of claim 35, wherein the electrical wiring associated with the ventilation fan assembly is passed from the second sub-compartment to an exterior of the main housing via at least one outlet aperture in a side wall of the main housing.

5

37. The ventilating and heating apparatus of claim 35, wherein electrical wiring associated with a fan in the fan housing is passed into the second sub-compartment via an aperture in the second dividing wall.

10

38. A ventilating and heating apparatus for installation in a building structure, the apparatus comprising:

a main housing;

a fan housing positioned in the main housing, the fan housing having a discharge duct terminating in a discharge outlet;

15

a heater secured within the discharge duct of the fan housing; and

20 a cover coupled to and substantially closing an open side of the main housing, the cover having a discharge aperture defined therein and in fluid communication with the discharge outlet of the fan housing, and the discharge aperture of the cover having a larger cross-sectional area than the discharge outlet of the fan housing such that edges of the cover defining a periphery of the discharge aperture are recessed with respect to the discharge outlet of the fan housing.

39. The ventilating and heating apparatus of claim 38, further comprising a gasket positioned between the cover and a periphery of the discharge outlet.

25

40. The ventilating and heating apparatus of claim 38, further comprising a screen substantially covering the discharge outlet.

30

41. The ventilating and heating apparatus of claim 38, wherein:

the discharge outlet lies in a plane;

an imaginary cylinder extends in a direction normal to the discharge outlet and has a cross-sectional shape and size that is the same as that of the discharge outlet; and
the heater lies outside of the imaginary cylinder.

42. The ventilating and heating apparatus of claim 38, wherein an area directly below the heater is shielded from the heater by at least one interior wall of the discharge duct.

43. The ventilating and heating apparatus of claim 38, wherein the heater is 5 located in a portion of the discharge duct defining an imaginary cylinder, and wherein substantially no part of the imaginary cylinder extends out of the discharge outlet.

44. The ventilating and heating apparatus of claim 38, wherein the heater is 10 removably secured in the discharge duct.

45. The ventilating and heating apparatus of claim 38, wherein:
the discharge duct includes a substantially straight portion extending from a central chamber of the fan housing, and an elbow extending from the substantially straight portion; and
15 the heater is positioned in the substantially straight portion of the discharge duct.

46. The ventilating and heating apparatus of claim 45, wherein:
the straight portion of the discharge duct defines a first cross-sectional area 20 taken along a plane normal to the straight portion;
the discharge outlet has a second cross-sectional area taken along a plane normal to airflow through the discharge outlet; and
the second cross-sectional area is less than the first cross-sectional area.

47. The ventilating and heating apparatus of claim 46, wherein a ratio of the first cross-sectional area to the second cross-sectional area is no greater than 4:1 and is no less than 1.125:1.

48. The ventilating and heating apparatus of claim 46, wherein a ratio of the first cross-sectional area to the second cross-sectional area is no greater than 1.75:1 and is no less than 1.25:1.

49. The ventilating and heating apparatus of claim 46, wherein a ratio of the first cross-sectional area to the second cross-sectional area is no greater than 1.625:1 and is no less than 1.375:1.

5 50. The ventilating and heating apparatus of claim 46, wherein a ratio of the first cross-sectional area to the second cross-sectional area is about 1.5:1.

10 51. The ventilating and heating apparatus of claim 38, further comprising at least one illumination device coupled to the main housing.

15 52. The ventilating and heating apparatus of claim 38, wherein the main housing includes at least one aperture therein and the fan housing includes at least one protrusion, and wherein the fan housing is removably coupled to the main housing by engaging the at least one protrusion within the at least one aperture.

20 53. The ventilating and heating apparatus of claim 38, wherein the fan housing includes

a first side wall having a peripheral flange extending therefrom in a direction substantially normal to the first side wall;

25 a second side wall substantially identical to the first side wall, spaced from the first side wall, and in a facing relationship with the first side wall; and

at least one additional wall coupled to the peripheral flanges of the first and second side walls and extending along the outer periphery of the first and second side walls.

30 54. The ventilating and heating apparatus of claim 38, further comprising a first dividing wall positioned in the main housing to at least partially separate the main housing into a first compartment and a second compartment;

a ventilation fan assembly positioned in the first compartment; and

an electrical compartment positioned in the first compartment at a location

adjacent the first dividing wall, the electrical compartment enclosing electrical wiring associated with the ventilation fan assembly.

55. The ventilating and heating apparatus of claim 54, further comprising a second dividing wall positioned in the second compartment and extending between the first dividing wall and a side wall of the main housing to subdivide the second compartment into a first sub-compartment and a second sub-compartment, wherein the fan housing is positioned in
5 the first sub-compartment, and wherein the electrical wiring associated with the ventilation fan assembly is passed through an aperture in the first dividing wall into the second sub-compartment.

56. The ventilating and heating apparatus of claim 55, wherein the electrical
10 wiring associated with the ventilation fan assembly is passed from the second sub-compartment to an exterior of the main housing via at least one outlet aperture in a side wall of the main housing.

57. The ventilating and heating apparatus of claim 55, wherein electrical wiring
15 associated with the fan in the first sub-compartment is passed into the second sub-compartment via an aperture in the second dividing wall.